
UNIT 1 - JUMP EQUIPMENT

RAM-AIR PARACHUTE
TRAINING MANUAL

BLM SMOKEJUMPERS

CHAPTER 1 - JUMP EQUIPMENT

In this chapter, the student will be issued ram-air jump gear and become familiar with the parachute and harness components. The equipment will be fitted, and the use of the components will be described.

The parachute deployment sequence will be shown, and proper use and care of the components will be demonstrated. Instructors are advised to periodically call on students and ask them to verbally prove or demonstrate physically their knowledge and retention of the material presented.

CHAPTER OBJECTIVES

At the completion of this Chapter the student must:

1. Identify the main components of the current BLM Smokejumper main Ram-Air parachutes.
2. Accurately identify the main components of the current BLM Smokejumper Ram-Air Harness.
3. Accurately identify the main components of the current BLM Smokejumper Drogue parachute.
4. Accurately identify the main components of the current BLM Smokejumper Ram-Air Reserve parachute.
5. Accurately identify the main components and function of the SMJ CYPRES AAD.
6. Accurately explain the deployment sequence of the current BLM Smokejumper Parachute System.
7. Accurately demonstrate both physically and verbally the proper procedures for attaching a Main Ram-Air parachute to a Ram-Air harness.
8. Accurately demonstrate the proper procedures for stowing their Reserve parachute when not in use and their harness when not attached to a main parachute.
9. Accurately identify at least three routine wear and tear items to jumper gear that can be expected in the field.

EQUIPMENT NEEDS

- 1 ea. - ram-air harness (for demonstration)
 - 2 ea. - DC-7 parachute (1 rigged and 1 unrigged model DC-7)
 - 1 ea. - drogue parachute
 - 2 ea. - ram-air reserve parachutes (1 with CYPRES AAD and 1 without)
 - 1 ea. - DVD "BLM Ram-Air Deployment Sequence" and monitor/DVD Player
 - # of students X 1 ea. - ram-air harnesses and jump gear for issue to students
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PRESENTATION

The following sequence of events is suggested for the parachute orientation class. Information on each element follows.

1. Issue and fit jump gear to each student.
2. Demonstrate deployment sequence by breaking down rigged main parachute and describing the stages of deployment. 'Can be done on table or with fully suited jumper in tower.'
3. Review equipment nomenclature: drogue d-bag, drogue parachute, main parachute, reserve parachute, and harness.
4. Demonstrate deployment of reserve parachute.
5. Explain care of harness and parachutes.

THE STUDENTS SHOULD BE ISSUED A COPY OF THE RAM-AIR GLOSSARY AND INSTRUCTED TO STUDY THE TERMS AND DEFINITIONS.

Lesson I ISSUE OF JUMP GEAR

Students will be issued and introduced to a complete set of serviceable jump gear.

LESSON OBJECTIVE:

- **Students will possess a complete set of serviceable jump gear.**

EQUIPMENT NEEDS: Complete set of serviceable gear for each student.

QUALIFIED LOFT PERSONNEL WILL THOROUGHLY INSPECT THE RAM-AIR HARNESSES BEFORE STUDENTS ARRIVE. (Refer to annual or In-service inspection guidelines).

1. Harness check points:

- ___harness complete and undamaged
- ___drogue release and main-release handles serviceable, cables are correct lengths and not frayed or kinked
- ___Reserve Static Line (RSL) lanyard and snap shackles functional
- ___webbing and stitching undamaged
- ___permanent tacking undamaged
- ___all hardware undamaged and functioning - 3-rings, snaps, Cobras

2. Fire line Gear Preparation

Instructors should collect and have the following gear ready before students arrive:

<ul style="list-style-type: none">___travel bag___P.G. bag___woody pal (optional)___hard hat___letdown rope___compass___mirror___signal panels (1)___canteens (2)	<ul style="list-style-type: none">___flagging (1 roll)___ear plugs___bug dope___ground-to-air signal card___mouthpiece___water proof sack.___Work gloves <p>Note: Pack out bags can be issued later.</p>
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After students arrive, instructors should distribute and size jump gear including:

- ___ jumpsuit
- ___ helmet
- ___ ram-air harness
- ___ flight gloves
- ___ P.G. bag (with fireline equipment above)
- ___ let down rope

3. Jump Gear Check

Instructors will help students size and inspect jumpsuit. *A more in-depth explanation of each jump gear component will follow in the Units Training Chapter (Buddy Checks).* At this time the instructor should simply introduce the equipment, make sure that the gear is serviceable, and show the student what a proper fit feels like. The inspection points should include:

- ___ Jump boots on?
- ___ Everything in jumpsuit that jumper will normally have packed in it?
- ___ Check for proper fit and padding of jump jacket and jump pants.
- ___ On jump jacket, check that neck collar and any excess wrinkles are tacked down so as not to interfere with sight of handles.
- ___ On jump pants, check for proper crotch strap adjustment and tack any excess stirrup strap.
- ___ Check if zippers on jacket and pants work.
- ___ Check adjustment of suspenders.
- ___ Stirrup keepers for low/no heel boots?
- ___ Check jump helmet for proper fit, serviceable face mask, and chin strap.
- ___ Check eyeglass restraints, if applicable (bands or wrap-around pieces).
- ___ Issue and fit flight gloves.
- ___ Verify letdown rope in right leg pocket.
- ___ Verify signal panel in leg pocket.

The following needs to be done when the loft issues the gear and must be done prior to the units.

WHILE HANGING THE STUDENT FROM PARACHUTE RISERS INSURE THAT:

- ___ Leg straps tight? (Prior to hanging)
- ___ Harness correct size? (One fist clearance between harness and shoulder)
- ___ Chest strap at correct height?
- ___ Main lift web straight?
- ___ Drogue release and Main Release Handle properly located?
- ___ Handles can be easily seen with helmet on?
- ___ Jumper hanging evenly?
- ___ Crotch strap still okay?
- ___ Toggles easy to reach?
- ___ All adjustments tacked?
- ___ Mouth guard properly located on helmet cage?
- ___ When pulling main release handle, do 3-rings release properly?

Lesson II MAIN PARACHUTE NOMENCLATURE

This unit introduces the students to the BLM Smokejumper Main parachutes.

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will identify verbally the components of the current BLM Smokejumper main Ram-Air parachutes.**

EQUIPMENT NEEDS

1 ea. - DC-7 Parachute

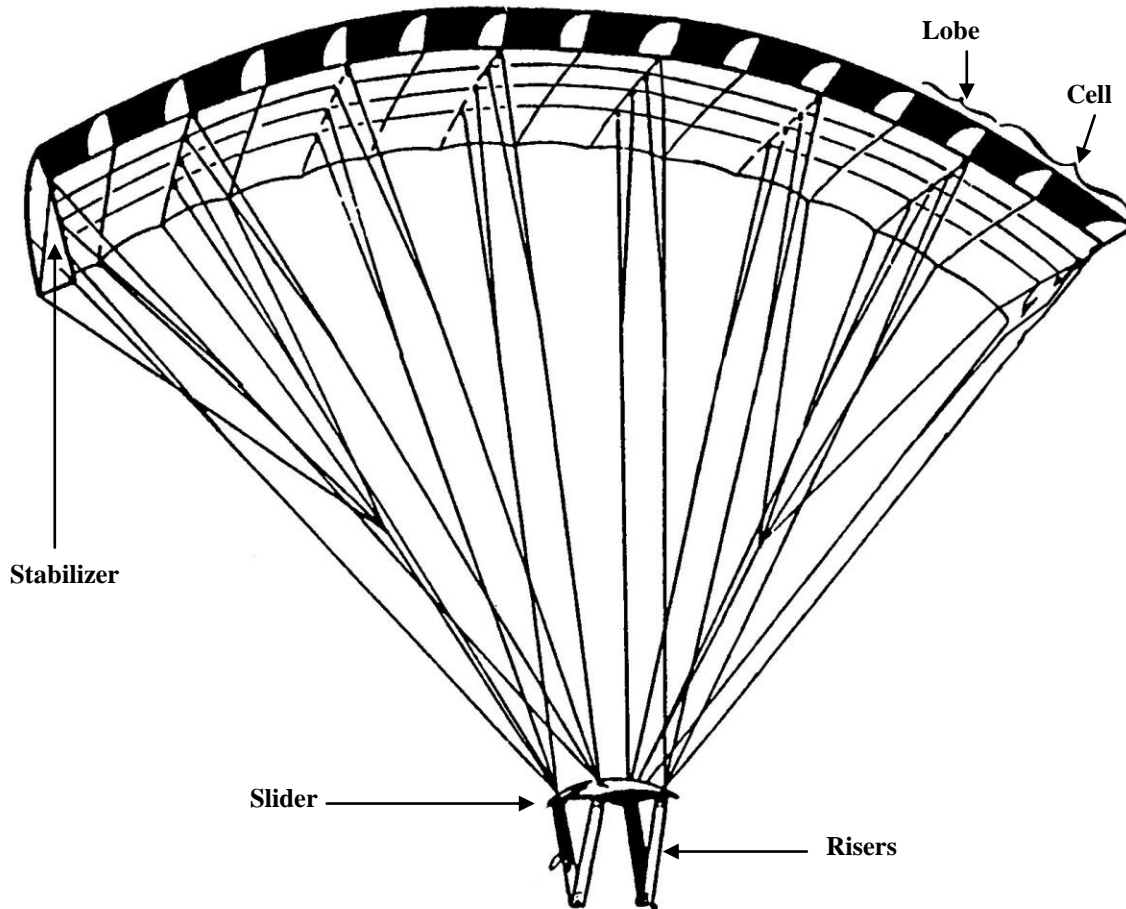
THE INSTRUCTOR WILL SHOW THE PARACHUTES USED IN THE BLM SMOKEJUMPER SYSTEM AND IDENTIFY THE MAIN COMPONENTS.

DC-7: 375 sq. ft., 7 cell, Ram-air canopy, max air speed about 20 to 25 mph. Updated MTIX (Goliath). Designed and Manufactured by Paraflite Inc., prior to April 2007. Purchased from and currently manufactured by Airborne Systems.

Show parts of parachute described in illustrations and definitions to include:

<ul style="list-style-type: none">__three rings__risers__nylon locking loop__French links__crosstie__steering toggles__control lines__slider__A lines__B lines__C lines__D lines__cascade lines__sundt or cat's eye	<ul style="list-style-type: none">__leading edge (nose)__trailing edge (tail)__stabilizer__lower surface (bottom skin)__upper surface (top skin)__ribs__crossports__cell__lobe__kill line ring__packing tabs
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Ram-Air Canopy



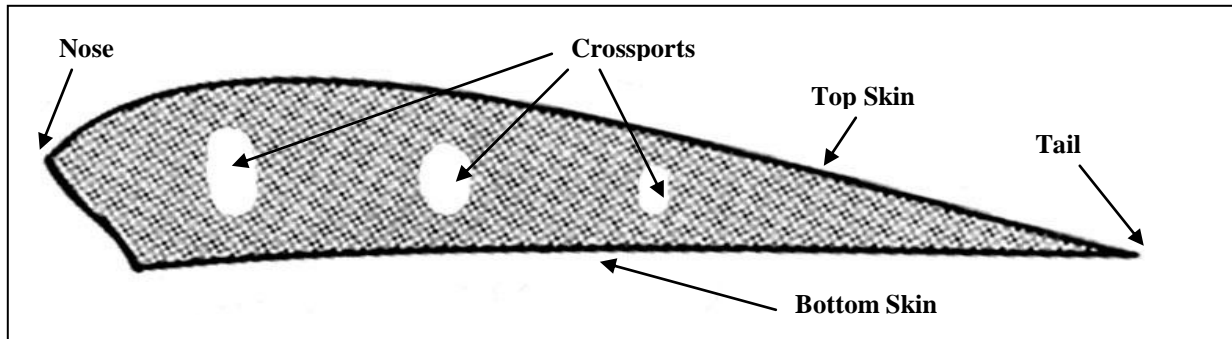
STABILIZER- Canopy material extending below the bottom skin on each side of the canopy designed to provide stability while flying in a deep brake setting.

SLIDER- A reefing device used to slow the opening of the canopy to prevent excessive opening shock.

RISERS-Webbing assemblies used primarily to transfer the load of the suspension lines to the parachute harness incorporating a three-ring attachment/release mechanism and velcro to stow the steering control toggles.

CELL- A chamber formed between the fabric of two load bearing ribs and the top and bottom skin of the ram-air canopy. Each cell is divided by one or more non-load bearing ribs forming lobes.

LOBE- One half of a ram-air cell.



Ram-Air Rib Profile

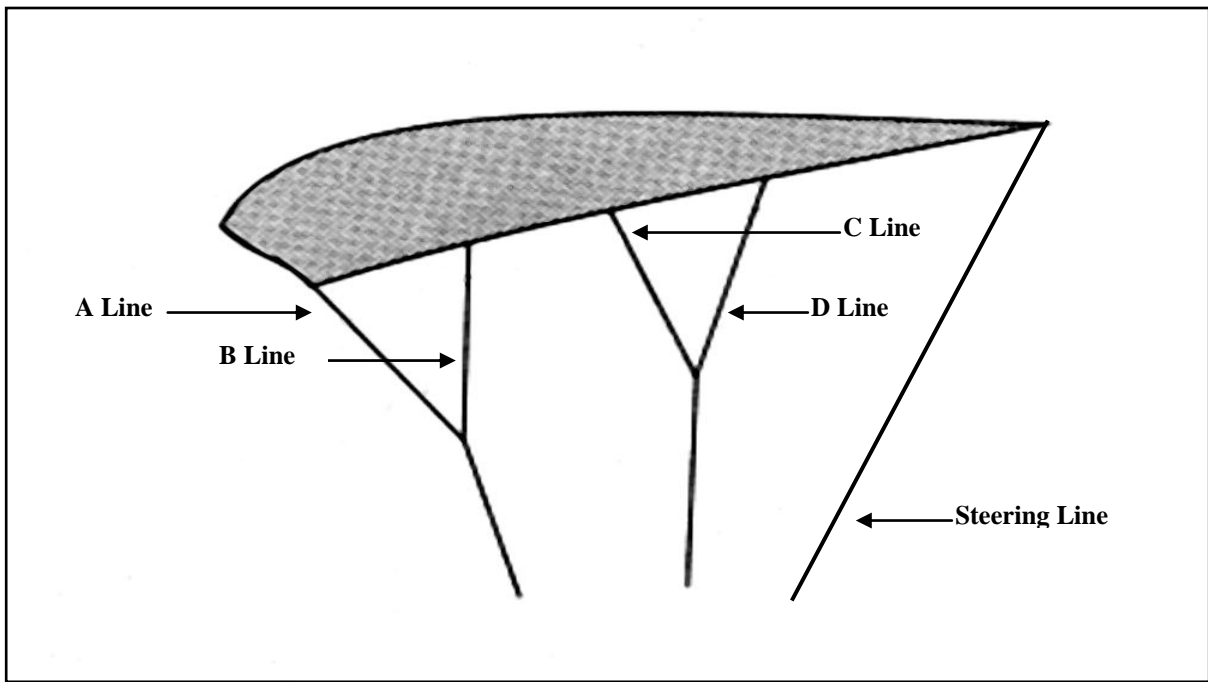
NOSE - The open leading edge or front of the ram-air canopy.

CROSSPORT - Small holes cut in the rib sections to balance the air pressure within the cells across the full span of the canopy and aids in inflation.

TAIL - Also known as the trailing edge refers to the rear of the ram-air canopy where the cascaded control lines are attached.

TOP SKIN - The top surface of the ram-air canopy.

BOTTOM SKIN - The lower surface of the ram-air canopy.



Ram-Air Lines

A, B, C, D LINES - (Suspension lines) The lines attaching the canopy to the connector links, transfers the load from the bottom skin of the parachute to the risers.

STEERING LINE - (Control lines, Brake lines) Attached to the trailing edge of the canopy in distinct left and right groups, the control lines are cascaded in the upper section joined to a single line attached to a steering toggle in the lower section. The lines used to steer and modulate the forward speed of the parachute.

Lesson III HARNESS NOMENCLATURE

This unit introduces the students to the current BLM Smokejumper Ram-Air Harness.

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will accurately identify verbally the components of the current BLM Smokejumper Ram-Air Harness.**

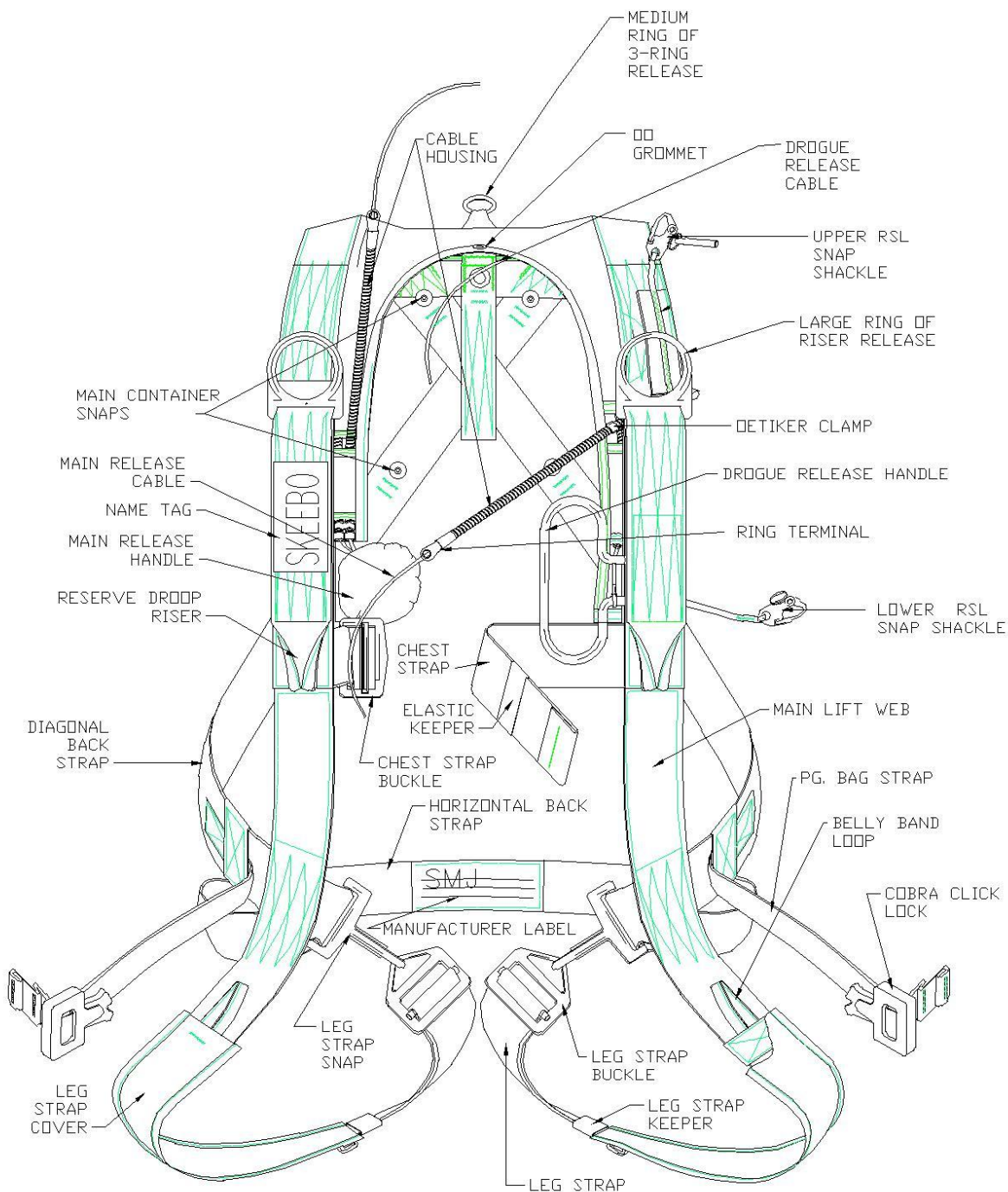
EQUIPMENT NEEDS

1 ea. - BLM Ram-Air Harness

OPTIONAL: Have each student bring to class their newly issued harness for illustration.

The ram-air harness is fitted especially for the components of the BLM smokejumper system. Refer to the illustration and present a hands-on review to include the following components:

<ul style="list-style-type: none">__leg strap snap__leg strap buckle__leg strap__leg strap keeper__leg strap cover__belly band loop__p.g. bag strap__cobra click lock__horizontal back strap__harness log__diagonal back strap__main lift web__chest strap__chest strap buckle__reserve droop riser__drogue release handle	<ul style="list-style-type: none">__housing cover__name tag__drogue release cable__main release handle__main release cable__snap shackle__reserve static line (RSL)__large ring of riser 3-ring release__cable housing__ring terminal__rubber band and grommet__yoke__medium ring of drogue 3-ring release__small ring of drogue 3-ring release__main container snap__Oetiker cable clamp
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Lesson IV DROGUE PARACHUTE NOMENCLATURE

This unit introduces the students to the current BLM Smokejumper Drogue parachute.

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will accurately identify verbally the components of the current BLM Smokejumper Drogue parachute.**

EQUIPMENT NEEDS

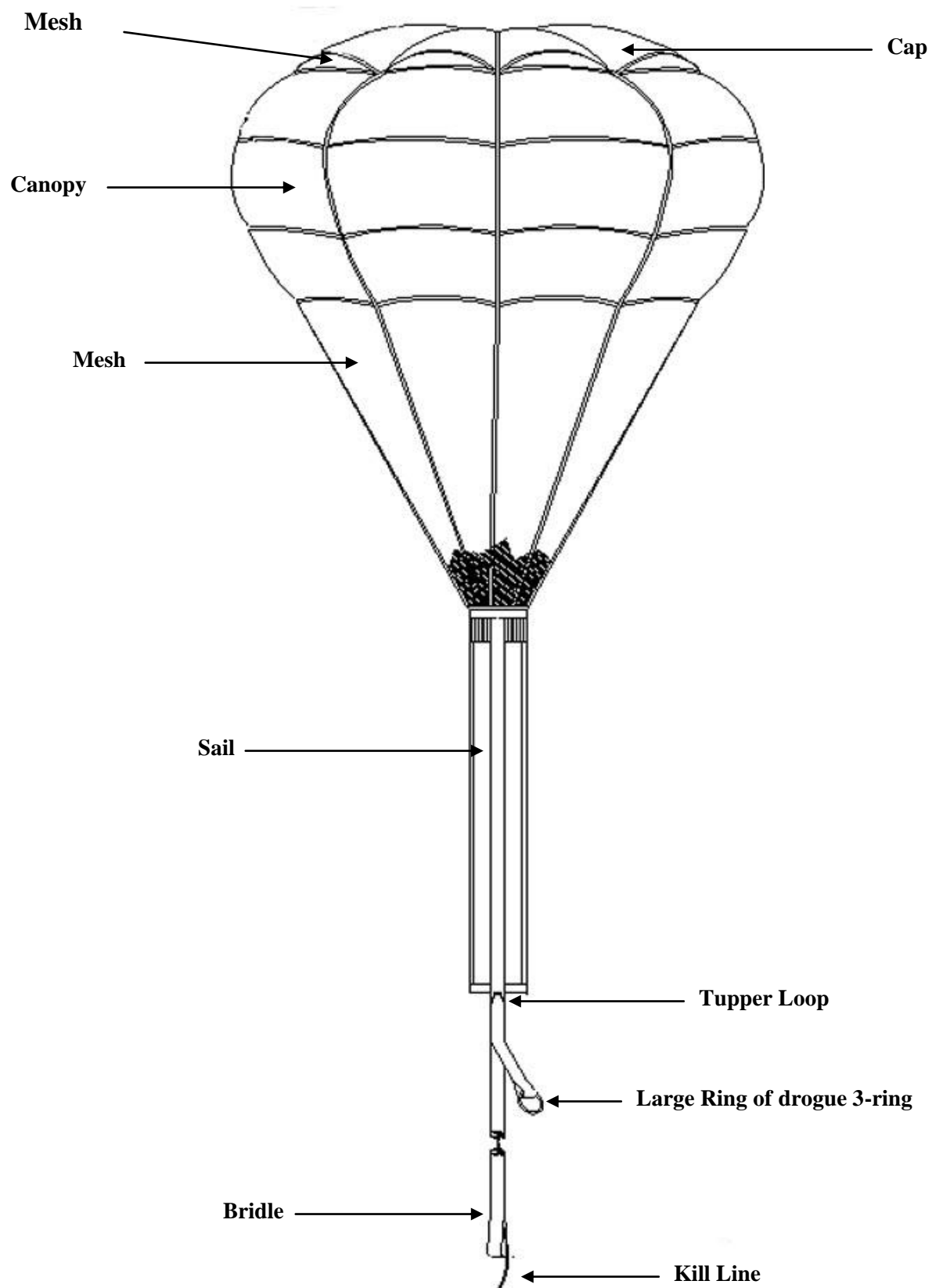
1 ea. - BLM Smokejumper Drogue parachute.

Function

The drogue parachute has two primary functions. First, the drogue serves to stabilize the jumper after exit while providing for good body position prior to deployment of the main parachute. Secondly, the drogue serves as a pilot chute for the main canopy after the jumper manually releases it from the harness.

Background

Soviet Union smokejumpers used a drogue deployment system for their round canopies during the 1970s. This concept was adopted by Jim Veitch and Ron Lund in 1979 for deploying ram-air canopies. Various versions were experimented with throughout the 1980s with the basic design coming into use in 1986. Zero porosity (ZP) fabric was used on the cap and/or main body from 1998-2000. Investigative work following the Liston fatality indicated that ZP drogues exhibited greater oscillations than drogues constructed with F-111 material. The increased oscillations were identified as an undesirable characteristic and may have been a contributing factor to the accident. ZP drogues were removed from service.



Drogue

Lesson V RESERVE PARACHUTE NOMENCLATURE

This unit introduces the students to the current BLM Smokejumper Reserve parachute.

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will accurately identify verbally the components of the current BLM Smokejumper Ram-Air Reserve parachute.**

EQUIPMENT NEEDS

1 ea.- BLM Smokejumper Reserve parachute (Paraflite MT-1S).

POWERPOINT FILES LOCATIONS:

See current year RATM file for power point lessons.

Background

MT-1S: 270 sq. ft., 5-cell, Ram- air canopy, max airspeed about 25 mph. This model was originally used as a main parachute during the early development of the ram-air system, circa 1981-1984. Flight characteristics are similar to the DC-7 but the smaller size results in increased forward speeds and a faster descent rate. Designed and manufactured by Paraflite Inc., prior to April 2007. Purchased and currently manufactured by Airborne Systems.

The attachment of the reserve to the ram-air harness using "droop risers" allows the parachute to ride in a similar position as the main when deployed.



Instructor should show the proper attachment of the reserve to the droop risers

Lesson VI SMJ CYPRES AAD NOMENCLATURE AND FUNCTION

This unit introduces the students to the current BLM Smokejumper Automatic Activation Device (AAD).

LESSON OBJECTIVE:

- **Accurately identify the main components and function of the SMJ CYPRES AAD.**

EQUIPMENT NEEDS

- 1 BLM Smokejumper Reserve parachute with installed CYPRES
- 2 CYPRES Components in unrigger configuration

POWERPOINT FILES LOCATIONS:

See current year RATM file for power point lessons.

Instructor Notes

The material can be covered through use of the power point lesson or by using the accompanying text. In either case it is highly preferable to have a CYPRES equipped reserve for each student so they can become familiar with the unit.

Reserve Confidence Instructor Notes:

In past years there have been some reservations amongst students about their confidence in the reserve parachute system. It is imperative that all rookies and current smokejumpers have the utmost faith in the reserve parachute system. A student must believe the reserve canopy will save their life and/or prevent serious injury in the event of a malfunction. There should be no hesitation to initiate emergency procedures when the malfunction procedure has failed to correct a malfunctioning canopy. The Reserve Confidence PowerPoint was designed to reinforce students' faith in the reserve parachute system and its unwavering ability to work every time.

I. SMJ CYPRES AAD Overview

The Smokejumper CYPRES 2 is an Automatic Activation Device (AAD) mounted on the reserve. The CYPRES determines vertical speed and altitude by measuring barometric pressure and will activate the reserve if vertical speed and altitude criteria are met.

II. Hardware

The Smokejumper CYPRES 2 consists of a control unit, processing unit, and release unit.



Control Head



Processing Unit

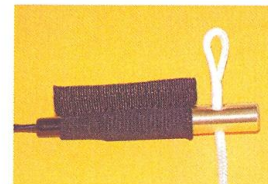


Release Unit (Cutter)

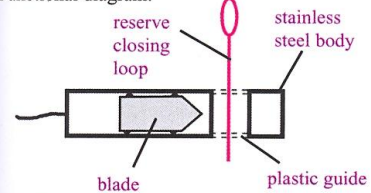
III. Activation Mechanism

The CYPRES activates the reserves by severing the reserve closing loops. The reserve closing loops are threaded through holes in the release units and are severed by a blade that is fired via a propellant should the processing unit give the signal to activate. It is important to note that the CYPRES is secondary to the reserve's primary means of activation; manual deployment via pulling the reserve handle.

Release unit (cutter) with elastic keeper

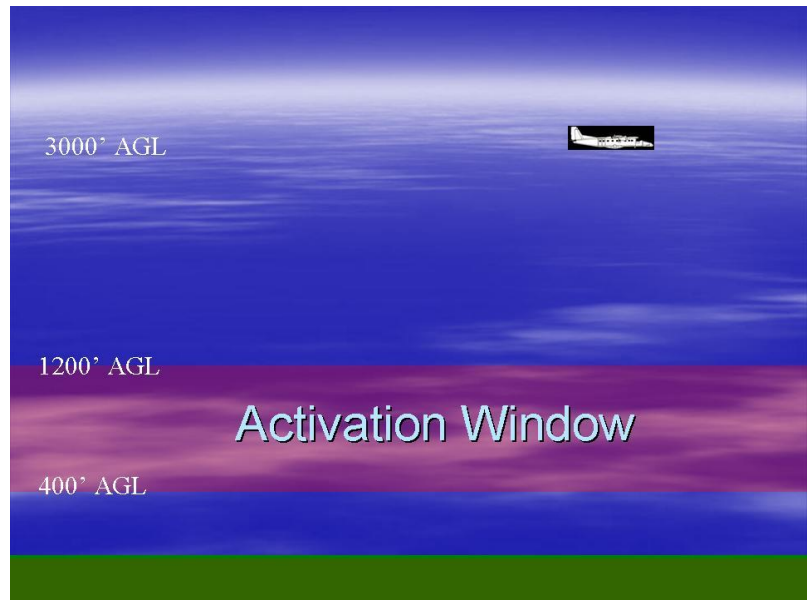


Functional diagram:



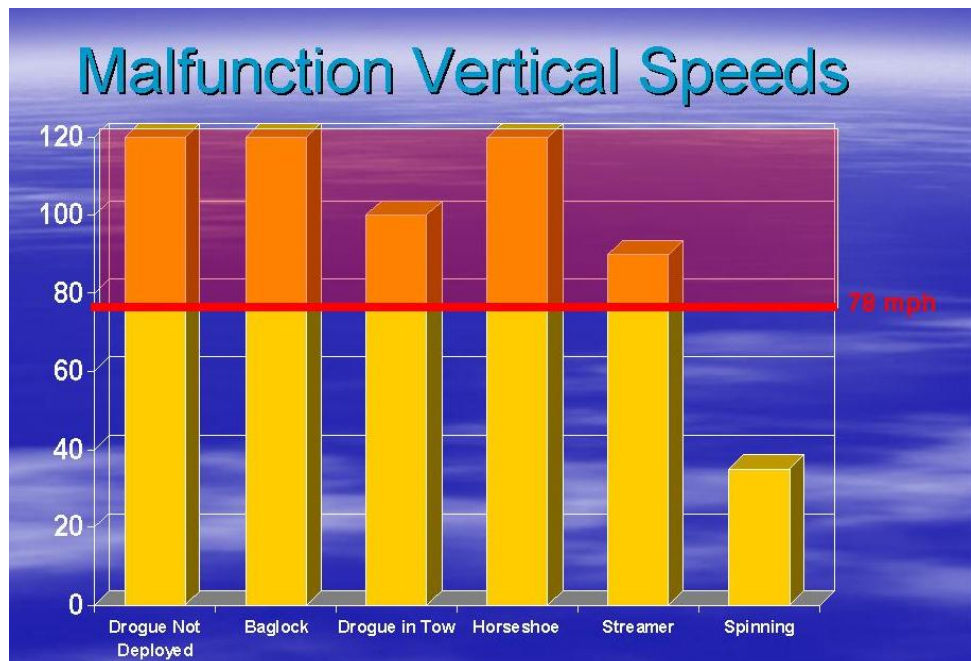
IV. Activation Criteria

The CYPRES will automatically activate the reserve if the jumper has a vertical speed exceeding 78 mph within the activation window. The activation window is determined by the altitude at which the unit is turned on. The activation window is 1800 feet below the altitude at which the unit is turned on and extends to 2600 feet below the altitude at which the unit was turned on and extends to 2600 feet below the altitude at which the unit was turned on. For a normal operational jump with an exit at 3000 feet above ground level (AGL) this would result in an activation window of 1200 feet AGL to 400 feet AGL.



V. Malfunction Vertical Speeds

Some but not all malfunctions result in high enough vertical speeds to meet the CYPRES criteria. Vertical speeds in excess of 78 mph are expected in all malfunction types where the main canopy fails to partially or fully deploy. Examples include drogue-in-tow, drogue not deployed, bag-lock, and



horseshoe types. Malfunctions with a partially deployed main canopy such as a streamer may or may not result in enough vertical speed to meet activation criteria. Malfunctions with a fully deployed but uncontrollable canopy such as a spinning type will almost certainly not result in a high enough vertical speed to activate the CYPRES.

VI. Functioning Test of Unit (Self Test)

The functioning test (self test) serves to verify that the CYPRES is in proper working order. It should be performed each day that the potential exists for the unit to be used on a jump.

The procedure for performing a self test is to push the orange button on the control head 4 times with short clicks. The red LED light will illuminate after the first push. Subsequent pushes must immediately follow the illumination of the light. After a total of four clicks the CYPRES will go into a self-test mode. If the buttons are pushed too fast or too slow the CYPRES will ignore the switch-on attempt.



The control head display will show the number “10” at the beginning of the self-test and countdown to “0”. A pause will occur between “2” and “0” and the display will show the actual air pressure in hPa (millibars).

The self test should only be done on the ground or while the aircraft is flying straight and level.

A successful self test will be indicated by the “0” at the end of the countdown and the display will then go blank.

VII. Turning Unit On and Off

The spotter issues the activation command after the prejump briefing and before the command to get in the door: **“We are at 3000’, activate your AAD.”** All jumpers designated to jump on the load will activate their CYPRES on the initial command. It is critical that the CYPRES is not activated prior to the spotter command. The CYPRES computes the activation window based on the altitude at time of arming and an incorrect arming altitude could result in the jumper exiting within the activation window.

The arming switch on the side of the reserve is used to turn the CYPRES on and off. The unit is turned on by pulling the arming tab up while guarding the front of the reserve. Red tape on the switch signifies the switch is in the armed position. The control head will display a “0” verifying that the unit is on and ready for jump operations.

The unit is turned off by pulling the arming tab down. The control head will turn blank verifying that the unit is off.

Picture demonstrates the “ON” or “ARMED” position.



VIII. Error Codes

An error code will be displayed on the control head if the unit detects a problem during the functioning test (self-test).

“1111” or “2222” indicates that one or both of the attached release units are not correctly connected. This could be due to a cable break, a disconnected cutter plug, or when the cutters have been activated.

“3333” indicates that excessive variations in ambient air pressure have been measured during the functioning test period. This could occur if the functioning test was performed in a flying aircraft. It is most likely to occur during a self test in the plane while climbing or descending. If this error occurs, make sure the aircraft is straight and level and repeat the self test.

Although a CYPRES with an error message does not pose a danger to the jumper if they jump with the unit, it is very important that the CYPRES be returned to a BLM loft to identify the cause of the error. **(See Watch Outs Below)**

- If the error message occurs during a functioning test performed on the ground, the reserve will be switched-out with a properly functioning reserve. The malfunctioning CYPRES reserve will be returned to one of the BLM lofts immediately.
- If an error message occurs in the aircraft, the reserve will be switched-out with the spotter reserve. The spotter will be notified immediately and the reserve will be returned to a BLM loft as soon as possible.

IX. Watch Outs

- Misfire potential is extremely low but reserves should always be securely guarded in aircraft when jump door or rear ramp is open.
- Units are not waterproof. Exercise diligent care to prevent wet reserves.
- Do not jump with a CYPRES that fails to turn on. No risk of a misfire exists with a unit that fails to turn on but loft needs to get it back in a timely fashion to determine cause of problem.

Lesson VII DEPLOYMENT SEQUENCE

This unit introduces the students to the deployment sequence of the current BLM Smokejumper Parachute System.

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will accurately explain verbally the deployment sequence of the current BLM Smokejumper Parachute System.**

EQUIPMENT NEEDS

- 1 ea. - Rigged BLM Smokejumper Ram-Air parachute.
- 1 ea. - Video, Deployment Sequence (located at the beginning of the malfunction video and on the exit video).
- 1 ea. – RATM Video Clips: “DC-7 Deployment Sequence Slow Speed”

Instructor Notes

Introduce deployments utilizing the video clips, proceed to a live deployment sequence with a rigged main in tower or on table, conclude with repeat of video clips.

MAIN DEPLOYMENT SEQUENCE

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will accurately explain verbally the main deployment sequence of the current BLM Smokejumper Parachute System.**
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The ram-air main follows this sequence when opening:

1. Static line opens drogue
2. Drogue stabilizes the jumper



3. Released drogue pulls main deployment bag off jumpers back
4. Lines deploy (locking stows keep canopy from opening before line stretch)



5. Main deployment bag is pulled off canopy
6. Canopy begins to inflate



7. Slider descends lines
8. Canopy fully inflates



THE RAM-AIR RESERVE DEPLOYMENT SEQUENCE:

1. Reserve static line (RSL) or jumper pulls reserve handle
2. Pilot chute deploys
3. Pilot chute pulls bridle from container
4. D-bag (freebag) is released from container after full bridle extension
5. Lines deploy (Locking stows keep canopy from opening before line stretch)
6. D-bag is pulled off canopy
7. Canopy begins to inflate
8. Droop risers break tacking placing risers in upper configuration
9. Slider descends line
10. Canopy fully inflates

Lesson VIII GEAR CARE

This unit introduces the students to the proper maintenance and care given to Ram-Air smokejumper equipment.

LESSON OBJECTIVE:

At the completion of this Lesson the students will:

- **Accurately demonstrate both physically and/or verbally the proper procedures for stowing their harness when not attached to a main parachute.**
- **Accurately identify verbally at least three routine wear and tear items to be expected in the field.**
- **Accurately demonstrate verbally or physically how to properly stow their reserve parachute when not in use.**

EQUIPMENT NEEDS

1 ea. - Full set of Ram-Air Jump gear

INSTRUCTORS WILL DISCUSS THE FOLLOWING ITEMS REGARDING CARE OF RAM-AIR EQUIPMENT:

_____stowing harness when not attached to main parachute

_____general care and respect for equipment

_____routine wear and tear to expect in the field

_____cleaning and inspecting drogue release and main release cables

_____how to stow reserve parachute

EACH PERSON IS RESPONSIBLE FOR THEIR "OWN" GEAR!

Lesson IX PARACHUTE HOOKUP

This unit introduces the students to the proper procedures for attaching a main parachute to a Ram-Air harness.

LESSON OBJECTIVE:

- **At the completion of this Lesson the students will accurately demonstrate both physically and verbally the proper procedures for attaching a main parachute to a Ram-Air harness.**

EQUIPMENT NEEDS

1 ea. - Rigged BLM Smokejumper Ram-Air main parachute.

1 ea.- Ram-Air Harness.

of students X 1 ea. - HANDOUT - The 3-ring release system

DISTRIBUTE AND DISCUSS THE 3-RING RELEASE SYSTEM HANDOUT. (THIS CAN BE FOUND AT THE END OF UNIT 1.)

Instructors will demonstrate the proper attachment of a main parachute to a ram-air harness.

Instructors will also demonstrate possible hookup errors.

Example of hookup errors:

- _____ cable mis-routed
- _____ improper 3-ring hookup
- _____ Reserve Static Line (RSL) mis-route
- _____ unseated snap shackle pin
- _____ handles not seated correctly

NOTE: The students should be introduced to these possible hookup errors at this time. They will, however, be re-tested on these in a later chapter (BUDDY CHECKS).

THE 3-RING RELEASE SYSTEM

INTRODUCTION

The 3-ring release system was invented by the Relative Workshop in 1976. It was the first practical release that allowed parachutists to jettison their mains by pulling a single handle.

Not only is the 3-ring easier to operate than previous canopy release systems, it is also more reliable. Failures of a properly built and assembled 3-ring system are virtually unknown.

Once the main is jettisoned, the only things left on the harness are two smooth rings that cannot snag a deploying reserve. Some other popular release systems can interfere with reserve deployment.

MODIFYING THE 3-RING RELEASE

The great reliability of the 3-ring system results from the proper functioning of each of its individual components. Therefore, the user should not modify the system in any way, nor should he replace genuine 3-ring parts with others.

These modifications (among others) will cause the system not to work properly:

- Not using a main-release handle that has special yellow-coated cable. This Teflon-impregnated coating is important; other plastic coatings may cause the cables to bind in the housings or loops, making it difficult or impossible to jettison the risers.

- Using a main-release handle with cables of the wrong length. The length of the cables insures that the risers release in the proper order.

GETTING TO KNOW THE 3-RING SYSTEM

Knowing how the 3-ring release works will help you assemble and inspect it properly.

Begin by peeling the main-release handle from the Velcro on the harness. Look behind the risers near the harness and observe the movement of the yellow cable as you pull the handle. When the cable clears the white loop, the release is initiated.

Now slowly pull one of the risers off the harness. As you pull, you'll notice that the white loop gets pulled through the grommet by the action of the smallest ring.

Because of the mechanical advantage provided by the 3-ring design, a force of only one pound on the top ring can keep the release together.

That's why it's important to keep foreign matter like bits of grass and sticks out of the 3-ring assembly. A small stick in the white loop could prevent a riser from releasing.

It's also important to understand one of the properties of the nylon components of the system. When nylon stays in the same position for a long time, it begins to conform to that position, or take a "set". If the 3-ring release system stays assembled for too long, the nylon can become so stiff that the low drag from a malfunction (such as a streamer) won't pull the riser off the ring.

3-RING RELEASE PRECAUTIONS

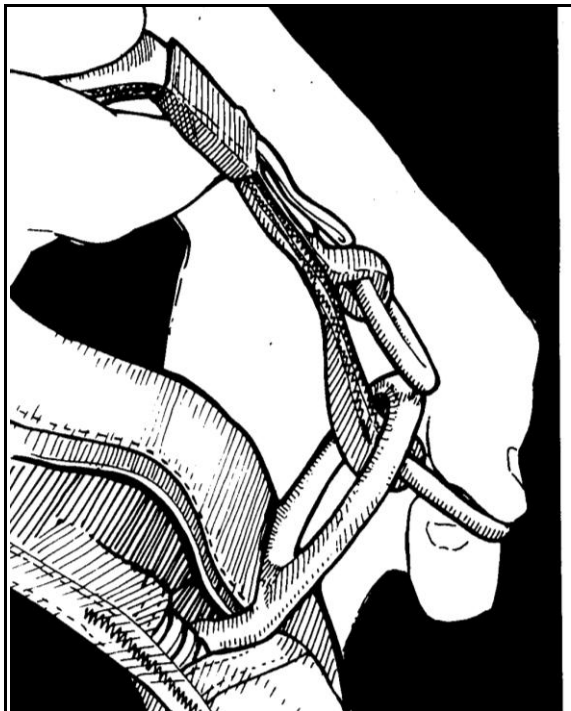
- **Proper alignment:** 3-rings need to be in correct alignment for proper function. The large ring of the drogue release 3-ring mechanism can be moved out of optimum position for opening. This situation has not been demonstrated to lock the 3-ring under expected drogue loads but may contribute to a hesitation of release. For the large ring to be in the proper position it must be upright in a parallel plane with the other two rings. It must not lay down over either of the other two rings where it might momentarily bind. Correctly attached riser 3-rings can not enter improper alignment. However, this situation can arise with a correctly manufactured and assembled drogue 3-ring assembly due to incidental movement as the jumper wears the equipment in the airplane. The rubber band keeper of the harness acts to ensure correct alignment. The large ring of the drogue 3-ring is held in an upright position by the rubber band keeper attached to the jumper's harness. The keeper is of light holding capability, just enough to maintain the large ring in position. The keeper releases with light load and does not interfere with the functioning of the drogue 3-ring mechanism while releasing. The keeper allows the jumper too quickly and easily positions the drogue large ring correctly when attaching the parachute to the harness. The keeper maintains the drogue large ring in proper position during normal jostling in the aircraft. The keeper is visually checked for correct drogue large ring position during prejump equipment checks.
- **Absence of debris:** 3-rings need to be free from debris for proper function. Because of the mechanical advantage provided by the 3-ring design, a force of only one pound on the top ring keeps the release together. That's why it's important to keep foreign matter like bits of grass and sticks out of the 3-ring assembly. A small stick in the white loop could prevent a riser from releasing. Smokejumper operations subject gear to foreign matter. It is essential that any foreign matter be removed prior to jumping. Visual inspection for debris must occur during parachute hook-up and subsequent equipment checks.
- **Supple Loop:** The nylon components, especially the loop, of the 3-ring assembly must be flexible. The nylon components of the system may become stiff if frozen or if the nylon stays in the same position for a long time. Below freezing temperatures have the potential for causing release hesitation or failure if the nylon was wet prior to being subjected to these conditions. Dry loops are unaffected by below freezing conditions and wet loops in above freezing conditions do not have a negative effect on releases. However, it is important to remember that air temperature decreases with altitude. Near freezing conditions at ground level likely indicates below freezing conditions at jump altitude. As you ascend through the

atmosphere the average rate of temperature change is 3.5 degrees per 1000 feet. The rate for unsaturated air is 5.4 degrees per 1000 feet. A jumpspot temperature of 48 degrees could result in below freezing conditions at a jump altitude of 3000' AGL. Inspection of the 3-ring assemblies for moisture must occur during parachute hook-up and subsequent equipment checks. Any possibility of encountering below freezing conditions with wet components must be avoided. Best option is to ensure all components of 3-ring assemblies are dry prior to jumping.

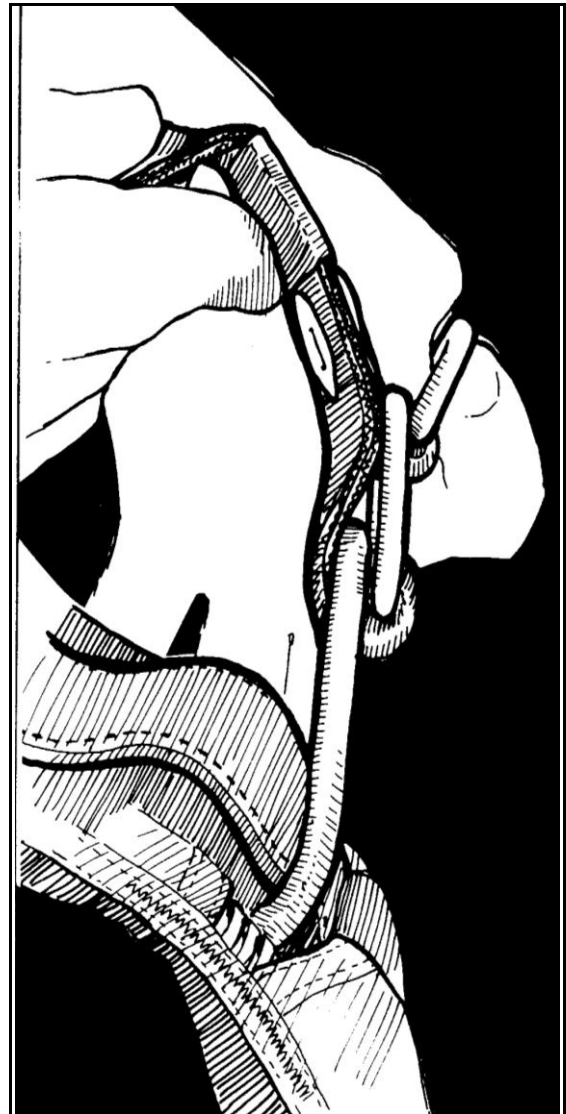
ASSEMBLY

Before assembling the 3-ring release, make sure the risers aren't twisted or reversed. Inspect nylon components for excessive dirt or debris. Flex and twist rings and loop to ensure supple movement of 3-ring assembly.

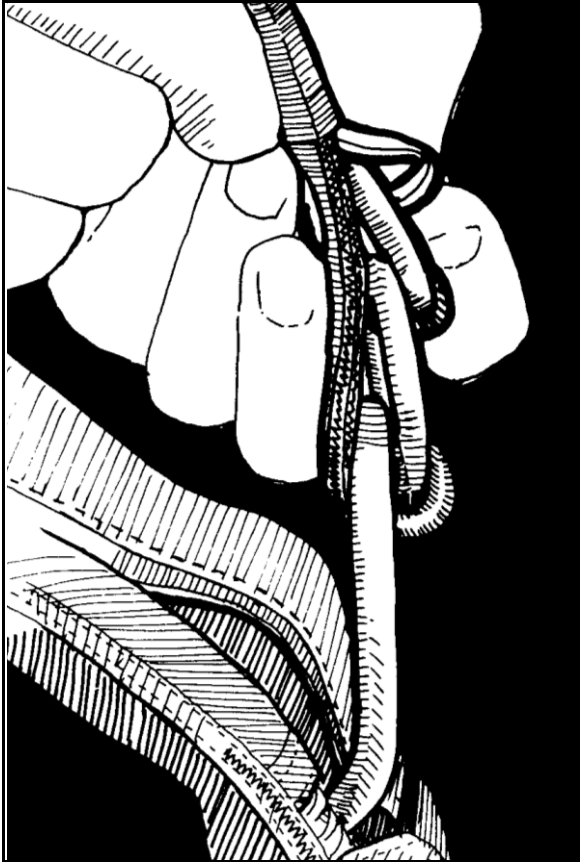
1. Thread each cable into its housing and stick the handle to the harness. The handle should be positioned as close to the end of the housing as possible so that no cable is exposed.
2. With the rings of the riser facing toward the floor, pass the ring on the end of the riser through the large harness ring from above. Fold it back toward the canopy and riser.



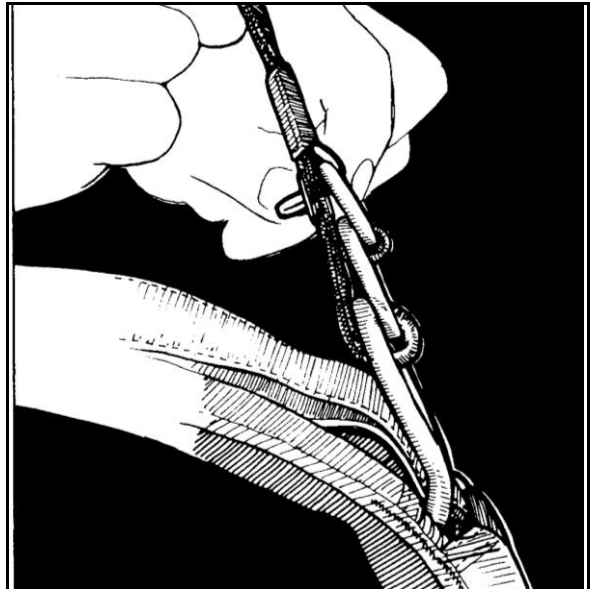
3. Thread the smallest ring through the middle ring the same way, but make sure it doesn't pass through the large ring.



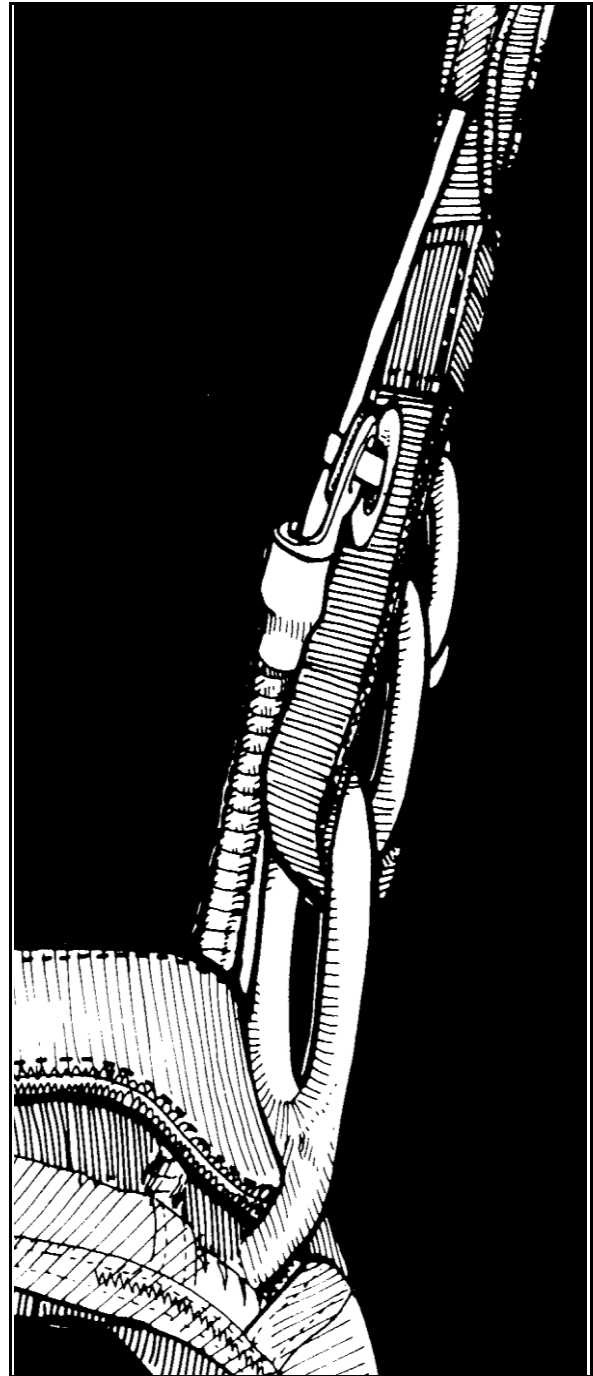
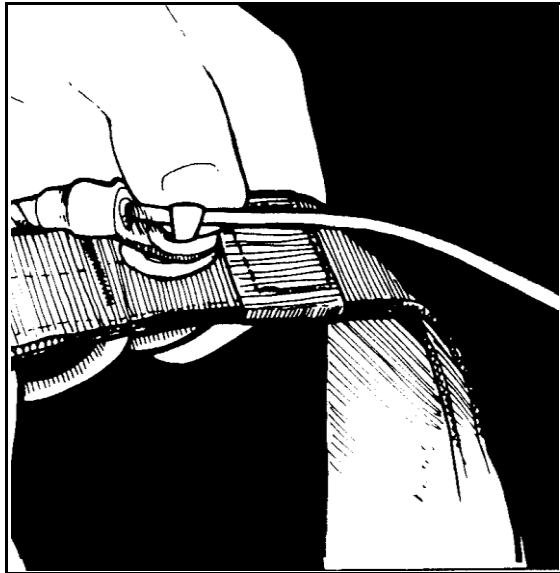
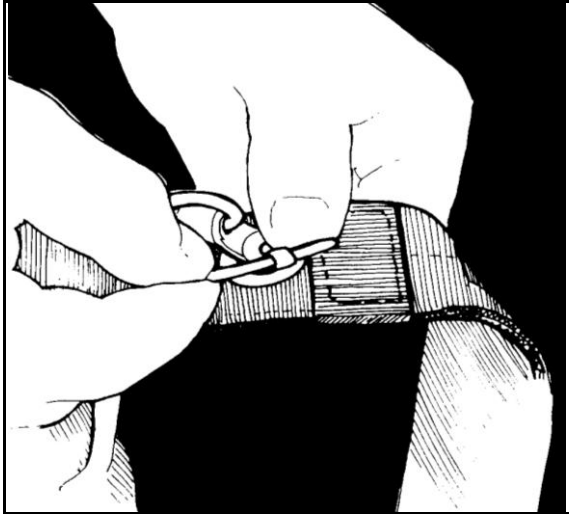
4. Bring the white loop over the small ring only, and then through the riser grommet so it pokes out the back of the riser.



5. Continue threading the white loop through the grommet on the end of the cable housing. The flat side of the housing grommet should be against the riser.



6. Thread the yellow cable through the white loop, making sure the loop isn't twisted. Be careful with the cable so you don't bend it too sharply or kink it. Insert the free end of the channel on the back of the riser.



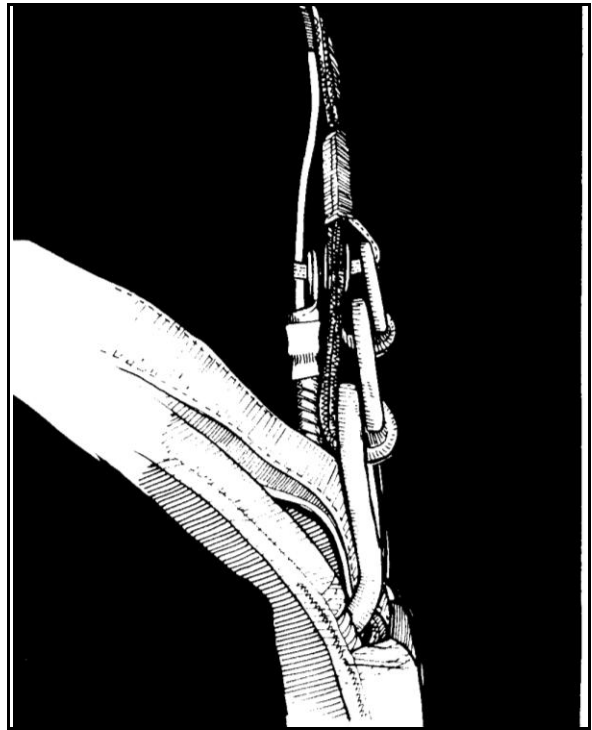
7. Repeat the above steps with the other riser and drogue release.

THE 3-RING RELEASE SYSTEM (continued)

PRE-JUMP INSPECTION

After hooking up your gear check the 3-ring release system for the following:

1. Each ring passes through only one other ring.
2. The white loop passes through only the small ring.
3. The white loop passes through the grommet on the end of the cable housing without twisting.
4. Nothing passes through the white loop except the yellow cable.
5. The 3-ring release handle is securely stuck to the harness, and no cable is visible between the handle and cable housings.



MISTAKES PEOPLE HAVE MADE IN THE PAST HOOKING UP THEIR 3-RINGS

1. Passing more than one ring through another ring.
2. Not passing the white loop through the grommet on the cable housing or not passing the yellow cable through the white loop. This will cause a riser to release when the main is deployed. If it is done on the drogue release 3-ring it will cause the main to deploy immediately after exit.
3. Drogue cable hooked up to a rear riser and a riser hooked up to the drogue. This will cause a drogue in tow. (Occurred on early version of BLM harness that featured long cable housings for both riser and drogue 3-rings. Not possible to do on current harness.)